Early childhood caries and breastfeeding: information available in Google versus scientific evidence

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ABSTRACT

Objective: Investigate the sources and type of information available on the internet regarding the association between breastfeeding and dental caries. **Methodology**: A cross-sectional study was conducted using the Google search engine to gather information on the association between breastfeeding and dental caries. The sample was composed of the first 100 search results. For each result, the following variables were collected: order of appearance, source of information, year, information on breastfeeding and caries (protective effect, risk factor, or undefined), and whether the result cites a scientific source. Statistical analysis involved the chi-square test to investigate whether the information available on the association between breastfeeding and dental caries varied in accordance with the source of information and the order of appearance of the result on the internet. **Results**: The most frequent sources of information on the internet were blogs of healthcare providers (n=38), scientific articles (n=20), blogs/sites of laypersons (n=15), and undergraduate course completion papers (n=15). Only 31% of the results reported that breastfeeding is associated with the occurrence of early childhood caries and this result was significantly higher (p=0.004) when the source was a healthcare provider (34.2%) than a layperson (19.0%). The declaration that there is no association between exposure and outcome was more frequent in the first results compared to those that appeared subsequently (p=0.018). **Conclusion**: Information available in Google on the association between breastfeeding and early childhood caries is not in agreement with the available scientific evidence, especially when laypersons are the source.

Keywords: social media; breastfeeding; dental caries.

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Cárie na Primeira infância e aleitamento materno: informações disponíveis no Google versus evidências científicas

RESUMO

Objetivo: Investigar as fontes e tipos de informações disponíveis na internet sobre a associação entre aleitamento materno e cárie dentária. **Metodologia**: Estudo transversal foi realizado usando a base de dados Google para reunir informações sobre a associação entre aleitamento materno e cárie dentária. A amostra foi composta pelos primeiros 100 resultados obtidos. Para cada resultado, as seguintes variáveis foram coletadas: ordem de aparecimento, fonte da informação, ano, informação sobre aleitamento materno e cárie (efeito protetor, fator de risco ou indefinido) e se o resultado citava fonte científica. Análise estatística incluiu teste qui-quadrado para investigar se as informações disponíveis sobre a associação entre aleitamento materno e cárie dentária variavam de acordo com a fonte e ordem de aparecimento do resultado na internet. **Resultados**: As fontes mais frequentes de informação na internet foram blogs de profissionais da saúde (n=38), artigos científicos (n=20), blogs/sites de leigos (n=15) e trabalhos de conclusão de curso (n=15). Somente 31% dos resultados reportaram que aleitamento materno está associado com a ocorrência de cárie na primeira infância e esse resultado foi significativamente maior (p=0,004) quando a fonte era de um professional da saúde (34,2%) do que de leigos (19,0%). A informação de que não há associação entre exposição e defecho foi mais frequente nos primeiros resultados comparados com aqueles que apareciam depois (p=0,018). **Conclusão** As informações disponíveis no Google sobre associação entre aleitamento materno e cárie na primeira infância não estão de acordo com as evidências científicas disponíveis, especialmente quando a fonte é de pessoas leigas.

Palavras-chave: acesso à informação por internet; aleitamento materno; cárie dentária.

INTRODUCTION

Early childhood caries (ECC) is the most prevalent disease in the preschool phase and can lead to pain and suffering, with a negative impact on the quality of life of children and their families (1–3). The etiology of ECC involves socioeconomic, behavioral, and biological factors. Among behavioral factors, the early introduction of sugar in the life of an infant and the high intake of foods and beverages with sugar should be the focus policies on the collective and individual levels (1).

Brazilian and international protocols indicate that exclusive breastfeeding up to six months of life is fundamental to the health and development of children. After this point, the infant should continue to breastfeed while solid foods are gradually introduced into the diet until approximately one year of age, when the child may have a diet similar to that of the family (4,5). However, some children continue to have breastmilk as their main source of nutrition even after one year of life (6) and birth cohort studies have consistently reported a greater risk of ECC in children with a high frequency of breastfeeding after one year of age (7).

Counseling for the prevention and control of dental caries should be based on the best available evidence. However, many families in Brazil have no access to such counseling in the first year of a child's life due to the low frequency of access to oral health services in this period (8). Thus, many individuals seek information on the internet, especially the

Google website, to determine the best treatment, causes, and consequences of diseases. However, social media have been the source of false information that is shared in an exponential manner, which can contribute to inadequate health-related practices. Indeed, strategies based on robust evidence, such as vaccinations, have been questioned, which has led to the reemergence of diseases that had been controlled in different populations (9).

Breastfeeding is a very sensitive topic. Besides being associated with the occurrence of ECC under specific conditions, it is the main practice for the promotion of child health in the first year of life. Thus, it is possible that information available in social media is contradictory and not based on the best available evidence. Recognizing these inconsistencies and associated factors could contribute to the discussion on this issue in the scientific community and enable clarifications for families, always defending breastfeeding as an irreplaceable practice for child health.

Therefore, the aim of the present study was to describe information available in Google on the association between breastfeeding and dental caries. A further aim was to investigate whether the available information on this association varies depending on the source (layperson or healthcare provider) and according to the order in which the information is available on the internet.

METHODS

A cross-sectional study was conducted using information available in Portuguese on the internet regarding the association between breastfeeding and early childhood caries.

Data collection

The Google search engine (www.google.com) was used for the selection of information available on the internet. The search strategy involved the following terms (in Portuguese) and Boolean operators: (breastfeeding OR mother's milk OR breast milk) AND caries. The first 100 results were considered for the data analysis. A graduate student in pediatric dentistry first underwent a training exercise for the search and categorization of the variables involving a detailed examination of the first ten results retrieved from the search. All information available in each result was read in full.

During the extraction of the data, the following variables were collected: order of appearance (1 to 100, subsequently categorized in quintiles), source of information, data reported in the source, whether breastfeeding has a protective effect regarding dental caries (yes, no, or undefined), whether breastfeeding is a risk factor for dental caries (yes, no, or undefined), and whether the result cited a scientific source (yes or no). The sources of information were categorized as scientific article, blog of dentist, blog of other health professional, blog of layperson, article by layperson, undergraduate or graduate course completion paper, association guidelines, and lecture resources. The sources of information were also classified as healthcare provider (scientific article,

blog of dentist, blog of other healthcare provider, course completion paper, association or health ministry guidelines, and class for dentistry course) and layperson (blog and article by layperson). The addresses were saved and subsequently accessed. In cases of doubt regarding the categorization of any variable during the examination of the 100 results, the decision was made after a discussion and agreement with an experienced epidemiologist.

Data analysis

The data were analyzed with the aid of the SPSS program (Chicago, IL, USA). The frequencies of the variables were described one by one. Due to the repetition of information or sentences in the sources that declared no association between breastfeeding and dental caries, content analysis was performed of these results and the most frequent sentences were described. The chi-square test was used to investigate whether the information available on the association between breastfeeding and dental caries varied according to the source of information and order of appearance of the result on the internet.

RESULTS

Among the first 100 links/sites/blogs, most sources of information were scientific articles (n = 20), blogs or sites of healthcare providers (n = 20), blogs/sites of dentists (n = 18), blogs of laypersons (n = 15), and course completion papers (CCP), dissertations, or theses (n = 15). Articles by laypersons and guidelines from the Health Ministry (HM) or dental association were also identified (Figure 1):

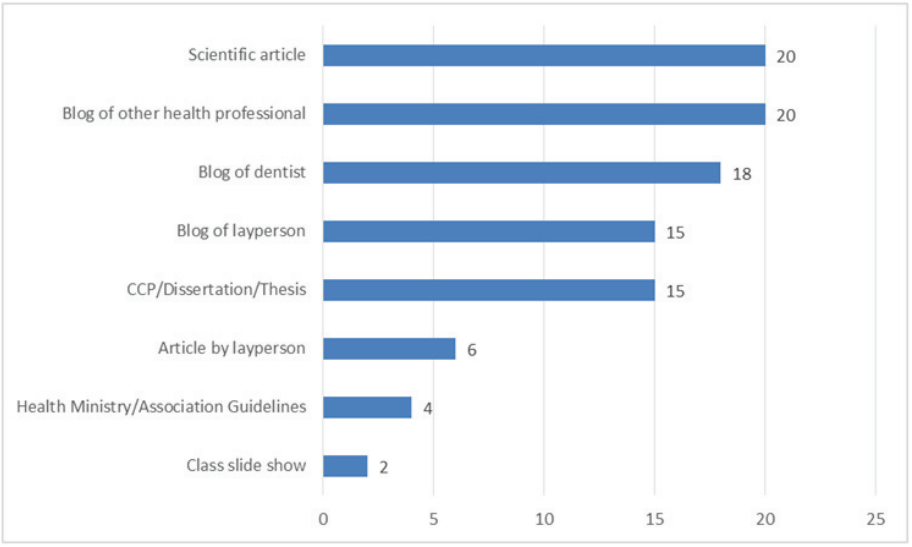

Figure 1 - Distribution of sources of information.

Among the 100 results examined, only 31 declared that breastfeeding was associated with the occurrence of ECC, whereas 40 sources claimed that breastfeeding is not a risk factor for dental caries, and 29 sources did not take a stance on the issue. Table 1 displays the information that most repeated among the sources claiming a lack of an association between exposure and outcome. The most prevalent information among these sources was that only food with sugar or bottle feeding with added sugar causes ECC. Moreover, 28 sources claimed that breastfeeding protects from dental caries. Some very specific information, such as breast milk does not cause caries because it does not come into contact with the teeth, was reproduced with the same words in different sources.

Table 1 - Most frequent information among sources claiming no association between breastfeeding and dental caries.

Information	N
"Breast milk does not cause caries; what causes caries is the introduction of sweetened foods at six months of age."	21
"Breast milk does not cause caries, but rather bottle feeding does due to the added sugar and the fact that the liquid comes into contact with the teeth."	17
"Breast milk does not cause caries, as it passes directly to the soft palate, not coming into contact with the teeth."	9
"Dentists discourage mothers from breastfeeding upon free demand and at night."	6
"*Breastfeeding does not cause caries; this is a huge myth widely disseminated among dentists."*	6
"Breastfeed your child in the way that suits you most, upon free demand or not, at night."	5
"*Scientists have proven that caries in babies is not the fault of breastfeeding."*	3

Table 2 shows that, among the sources from healthcare providers, independently of the form (article, blog/site, or guidelines), 34.2% declared that breastfeeding was associated with ECC, 31.6% declared that it was not associated, and 34.2% did not take a stance on this association. Among the lay sources, 71.5% declared that breastfeeding and ECC were not associated, 9.5% did not take a stance, and only 19.0% recognized the association between exposure and outcome. This difference was statistically significant ($p = 0.004$). Moreover, a significant association was found between the type of information and the order of appearance in the search results ($p = 0.018$). Among the first 20 results, 70.0% declared no association between breastfeeding and ECC, with a reduction in this figure beginning with the subsequent quintiles. Moreover, a lack of a definition regarding the association was infrequent in the first quintile and increased in frequency beginning with the second quintile.

Table 2 - Information on association between breastfeeding and early childhood caries (ECC) according to source of information and order of appearance.

Variable	N	Breastfeeding associated with ECC						p
		Yes		No		Undefined		
		n	(%)	n	(%)	n	(%)	
Source								0.004
Healthcare provider	79	27	(34.2)	25	(31.6)	27	(34.2)	
Layperson	21	4	(19.0)	15	(71.5)	2	(9.5)	
Order of appearance								0.018
1st quintile (1-20)	20	5	(25.0)	14	(70.0)	1	(5.0)	
2nd quintile (21-40)	20	9	(45.0)	6	(30.0)	5	(25.0)	
3rd quintile (41-60)	20	6	(30.0)	9	(45.0)	5	(25.0)	
4th quintile (61-80)	20	7	(35.0)	6	(30.0)	7	(35.0)	
5th quintile (81-100)	20	4	(20.0)	5	(25.0)	11	(55.0)	

The frequency of the citation of references in the literature was significantly greater ($p = 0.008$) among the healthcare providers (77.2%) compared to the laypersons (47.6%).

DISCUSSION

The change in the way individuals seek health-related information, advice, and treatment motivated the present investigation of what laypersons and healthcare providers would find on the internet regarding the association between breastfeeding and dental caries. The most important result was the low frequency of evidence-based information, especially among laypersons and among the first 20 search results.

The benefits of breastfeeding for a child's general health are well documented. Children breastfed longer have less morbidity and mortality, fewer malocclusions, and greater intelligence than those breastfed for shorter periods and those not breastfed (4). Recent evidence also suggests that breastfeeding may protect from the early introduction of sugar and nonnutritive sucking habits, excess weight, and diabetes (4,10,11). Moreover, breastfeeding is protective for mothers, as it may prevent breast cancer, increase the time between births, and reduce the risk of the development of diabetes and ovarian cancer. The World Health Organization recommends exclusive breastfeeding until six months of age and breastfeeding complemented with supplemental feeding is suggested up to two years of age (12).

On the other hand, birth cohort studies in different populations are consistent in recognizing that a high frequency of breastfeeding after 12, 18, or 24 months is associated with a significant increase in the risk of caries, even after adjusting for sugar intake and socioeconomic status (7). However, the risk of caries stems from a specific pattern of breastfeeding and the transmission of this information to society is a sensitive point

for both laypersons and healthcare providers, who are also responsible for promoting breastfeeding. This at least partially explains the inconsistency in the information available in social media and the scientific evidence, especially when the source is a layperson and the first 20 search results, which are the most accessed. It is interesting to note that even a substantial proportion of healthcare providers furnish inadequate information on this issue. Moreover, repeated information extracted from different sources on the internet in the form of sentences reveal disinformation (when stating that only bottle feeding is associated with caries) and even a kind of denial (when stating that the association is a myth propagated by dentists or that it has been proven that caries has no association with breastfeeding).

Inadequate information on the internet (Google, Facebook, and Twitter) regarding the causes, prevention, and treatment of diseases is no novelty (9,13,14). To the best of our knowledge, however, this is the first study to investigate information available in social media regarding the association between breastfeeding and ECC. Among the implications of the present findings, there is a growing need to inform laypersons and healthcare providers regarding the risk factors of caries, including the effect of prolonged, frequent breastfeeding. While public policies should be put in place for the entire population regarding the need to avoid the early and frequent intake of sugar to ensure the prevention and control of noncommunicable diseases, information on the risk of this breastfeeding pattern should be part of specific counseling directed at individuals with this behavior. The available evidence indicates that a reduction in the frequency of breastfeeding after the child completes one year of age has the potential to reduce the risk of ECC without affecting the benefits associated with breastfeeding (7). This information should not be omitted when counseling mothers of children with a high frequency of breastfeeding after 12 months of age, considering the possibility of the emergence of caries or the aggravation of caries that have already been installed and the impact of this condition on quality of life.

The fact that scientific references are cited by sources that agree as well as those that disagree that breastfeeding is a risk factor for ECC is not necessarily a contradiction. In fact, the divergent results are found, as some laboratory studies have reported that the effect of breast milk on mineral loss is plausible, whereas other laboratory have not (15,16). Nonetheless, there are other associations in the medical literature demonstrated in epidemiological studies that take years or decades to be understood in the laboratory, such as the association between smoking and lung cancer. Therefore, it is undeniable that the level of evidence from longitudinal studies controlling for confounding factors is much higher than evidence from laboratory studies and should be the basis of information for policies and programs.

Some methodological issues of the present study merit discussion. The information was exclusively from Google and probably does not represent all information available to laypersons. However, this is unquestionably the most widely used source for investigating symptoms, causes, and treatments (17). Moreover, the sample size was composed of 100 search results, which determines a relatively low power to detect relevant associations.

However, it is possible that the search for information by laypersons in general is limited to the first pages retrieved during a search.

CONCLUSIONS

The analysis of information available on the internet regarding the association between breastfeeding and dental caries demonstrated that only one-third of the results recognize that specific breastfeeding patterns are associated with the occurrence of the disease. The frequency of evidence-based information is even lower when the source of information is a layperson and among the first search results returned.

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